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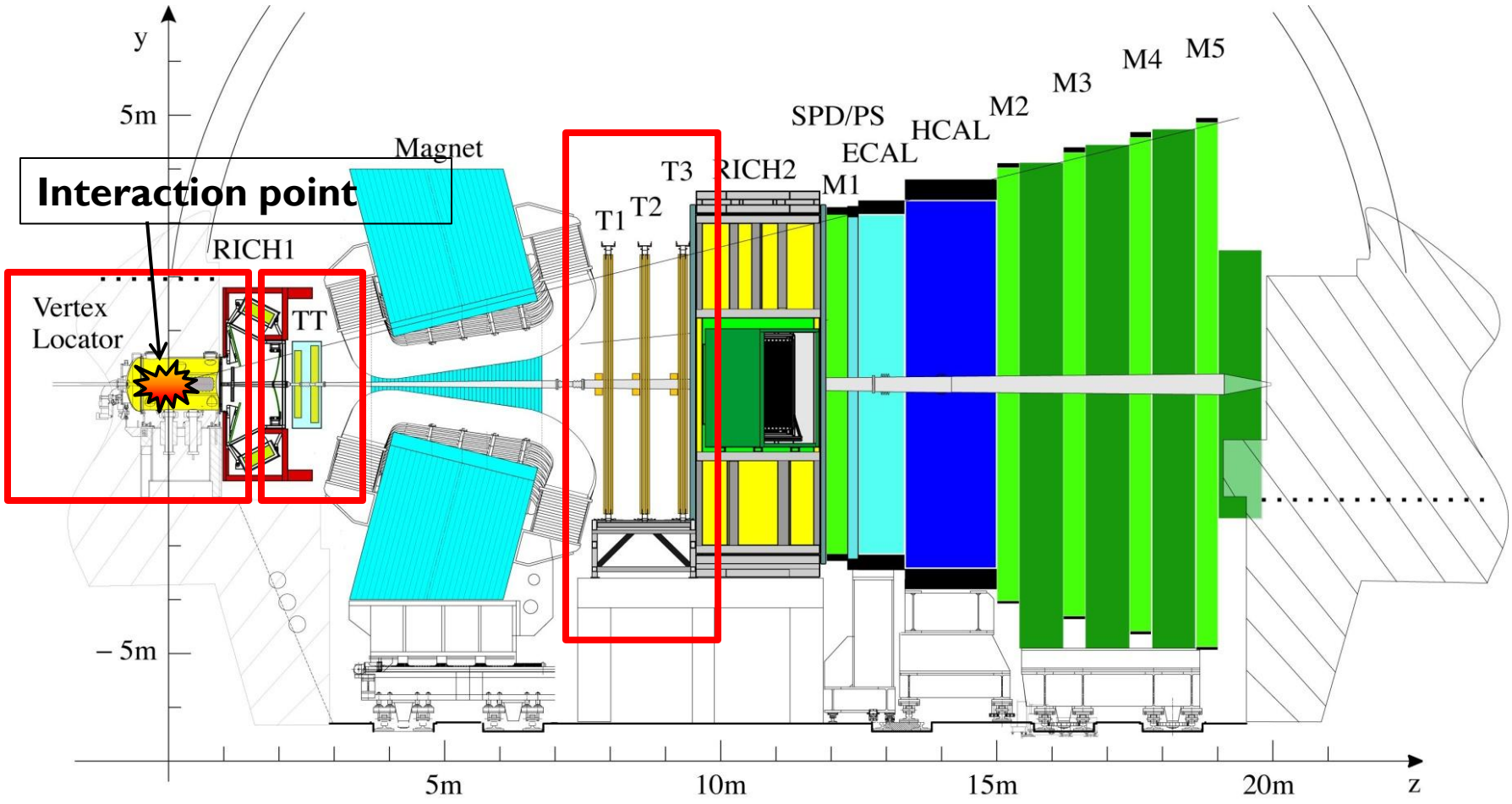
on behalf of the LHCb collaboration

Impact of tracking performance on K_s reconstruction

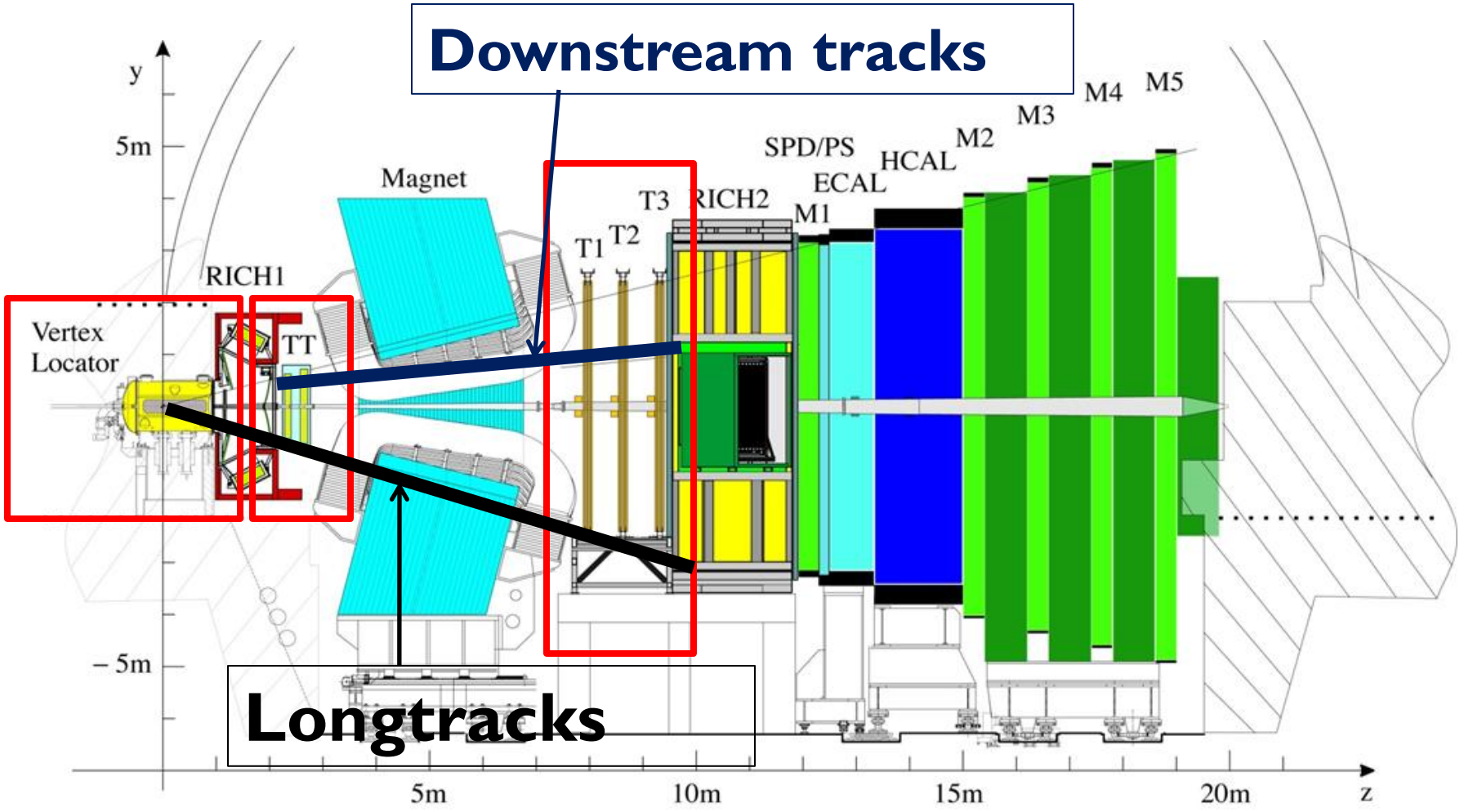
Recontres de Moriond 2010, La Thuile

The LHCb tracking system



Vertex Locator | Trigger Tracker | T-Stations (IT / OT)

The LHCb tracking system

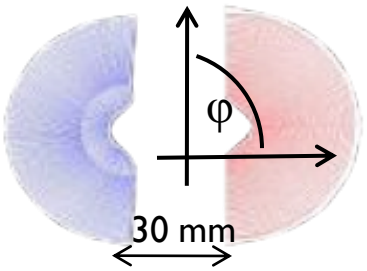


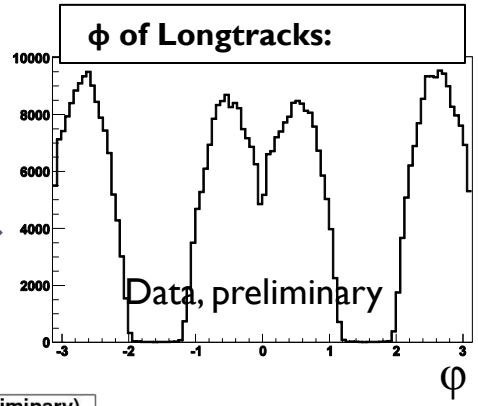
Vertex Locator | Trigger Tracker | T-Stations (IT / OT)

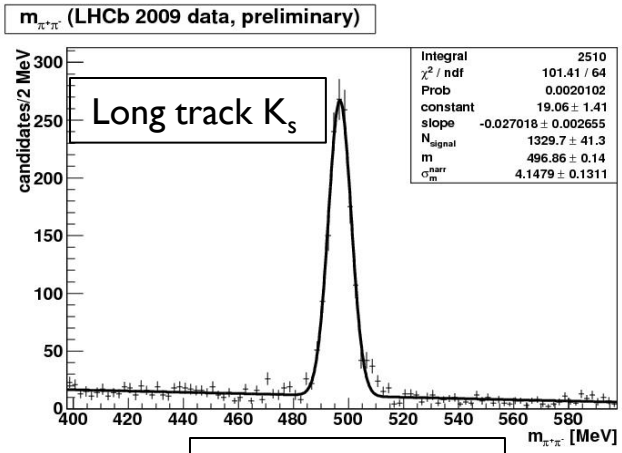
Complementary analyses

Longtracks:

Open Velo in 2009:



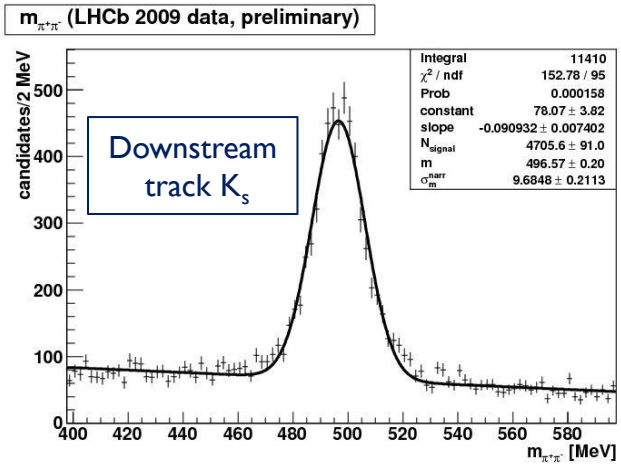




N = 1330
σ = 4.1 MeV

Downstream tracks:

- K_s long lived
  - Most of K_s decay after Vertex Locator



N = 4706
σ = 9.7 MeV

K_s production rate in 2009 data

- Exploits unique η range (1.9 – 4.9) covered by LHCb

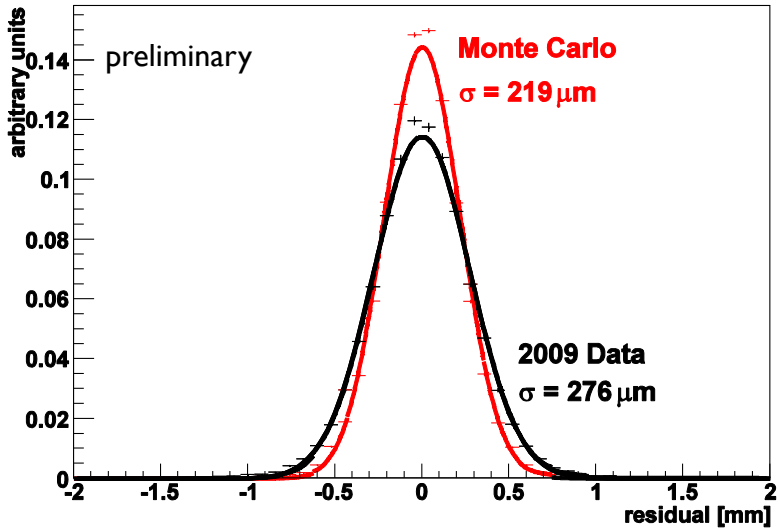
$$L \times \sigma_{K_s} = N_{K_s \to \pi^+\pi^-} \times \varepsilon_{reco}^{-1} \times \varepsilon_{trigger}^{-1}$$

P. Hopchev, YSF

data MC data

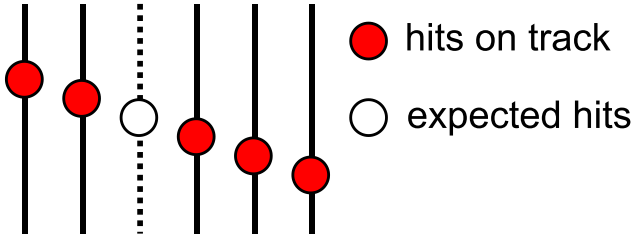
- Monte Carlo has to represent data
  - Understanding of tracking system crucial

e.g. Hit residuals in OT:

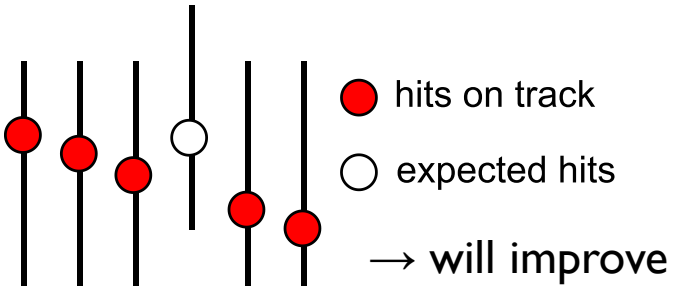


Hit finding efficiency in pattern recognition

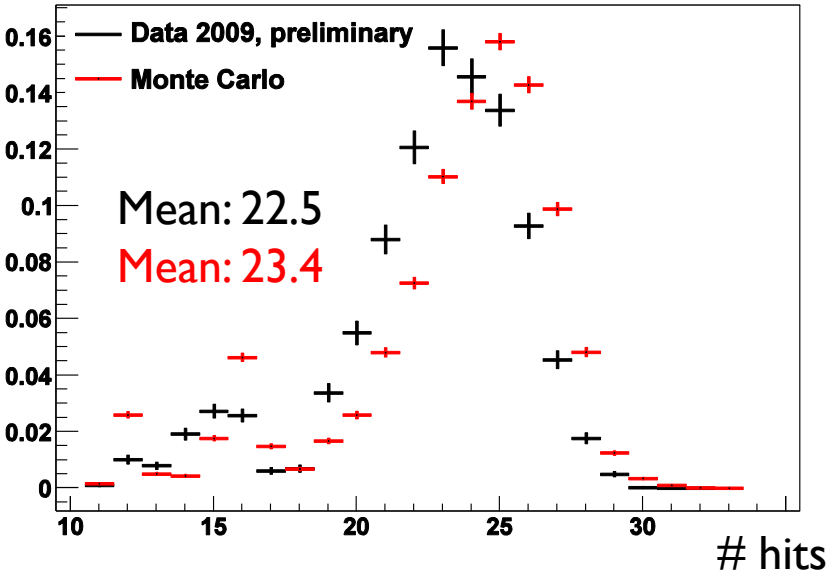
- Dead channels (<1.0%)



- Misalignment / Calibration



Number of hits on K_s daughter tracks:



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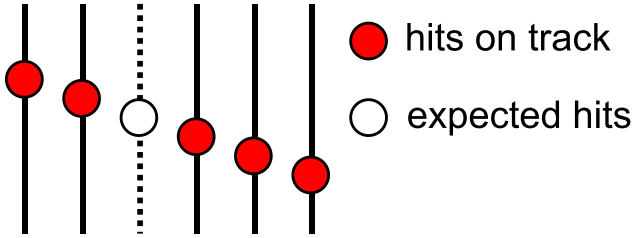

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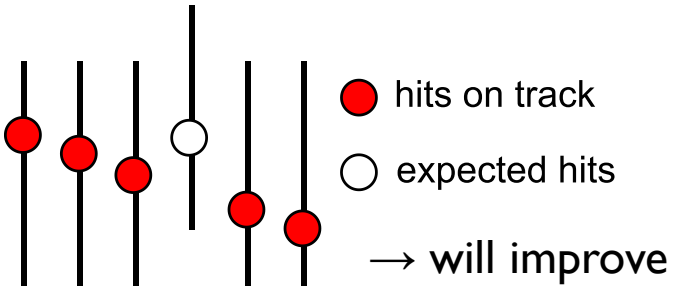
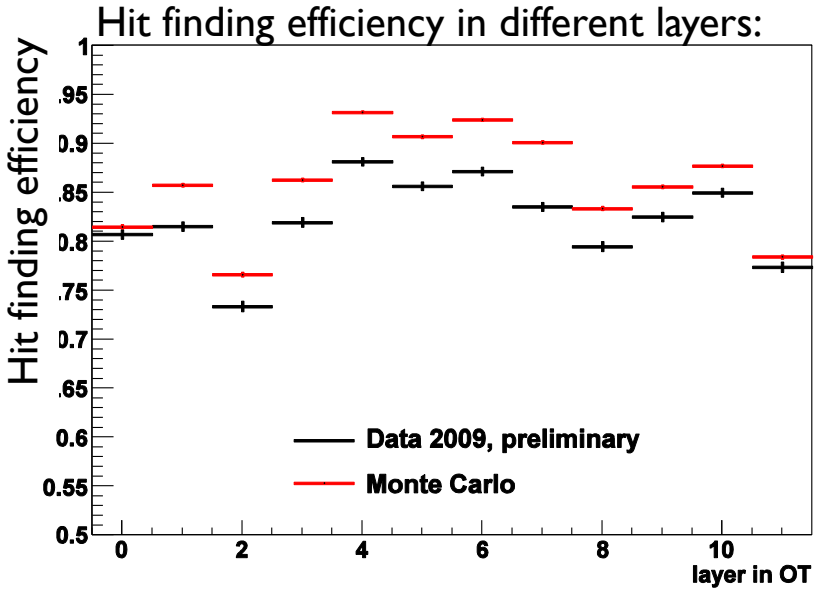
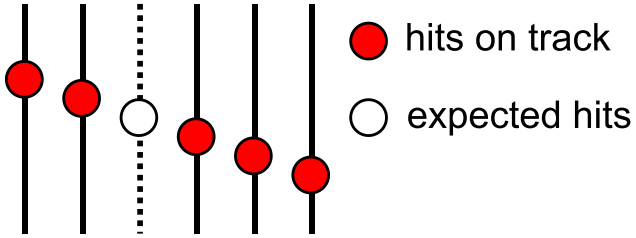




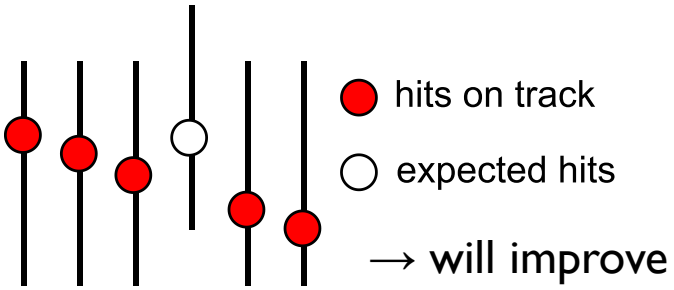
- Correct for this discrepancy

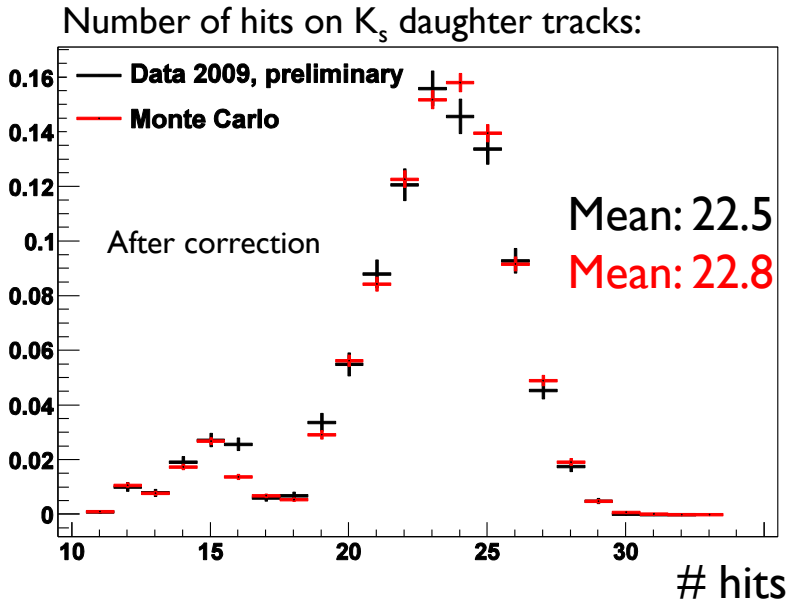
Hit finding efficiency in pattern recognition

- Dead channels (<1.0%)



- Misalignment / Calibration



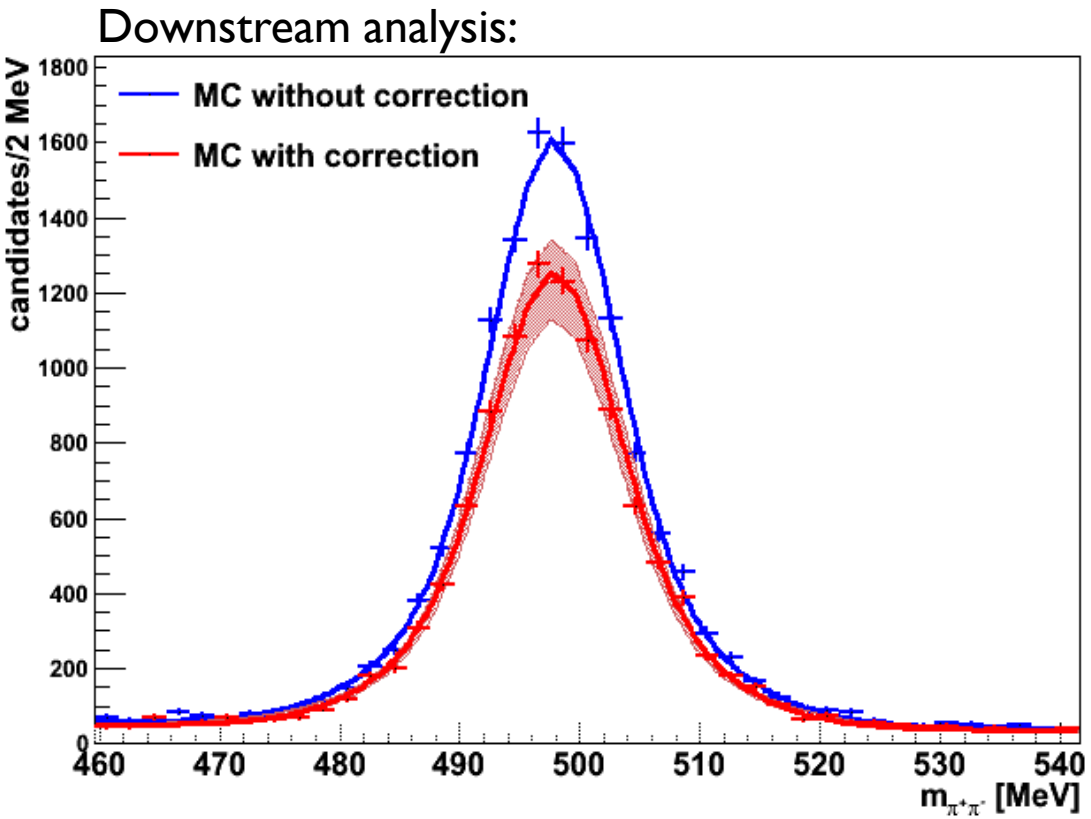


- Monte Carlo matches data
  - Overall
  - Individual subdetectors

Result of corrections

- Significant impact on the signal yield
- Crucial to evaluate systematics

Downstream analysis:



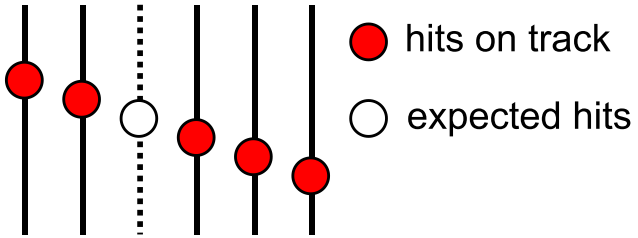
Summary

- Tracking efficiency is good and improves
  - Alignment and calibration is getting better
- K_s are a great opportunity to test the tracking system
  - Learned a lot
  - Good Monte Carlo and data agreement achieved
- First results are on the way

Backup

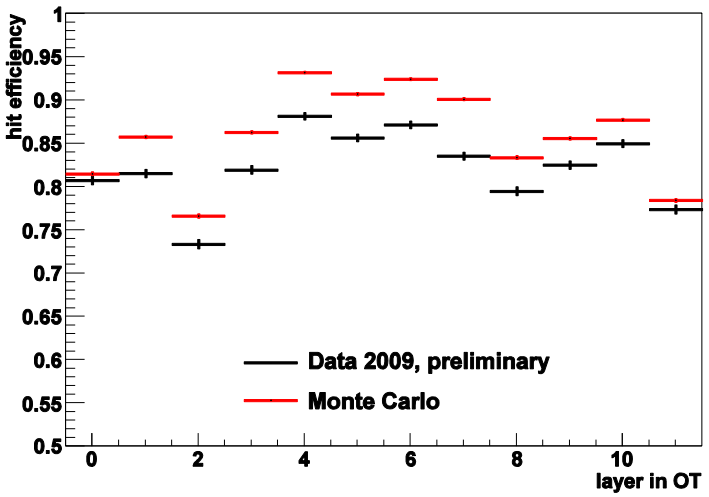
Correction procedure

Look at hit efficiency in all layers of the tracking system.



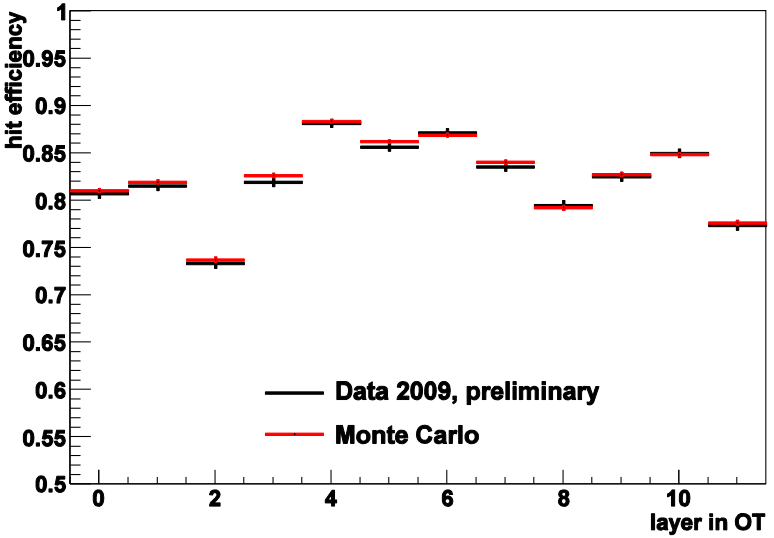
$$\varepsilon = \frac{\#\text{hits on track}}{\#\text{expected hits}}$$

Before correction:

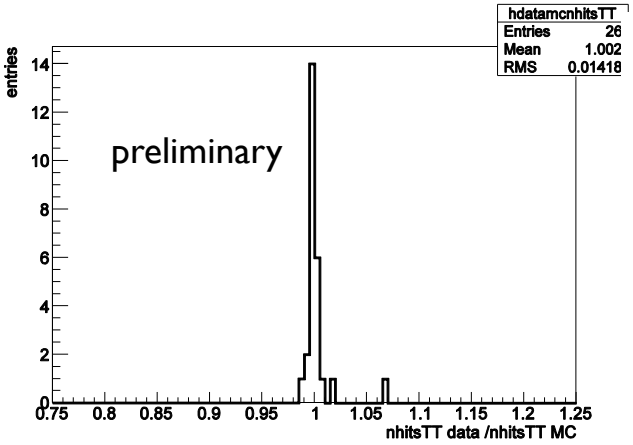


$$\times \frac{\varepsilon_{data}}{\varepsilon_{MC}}$$

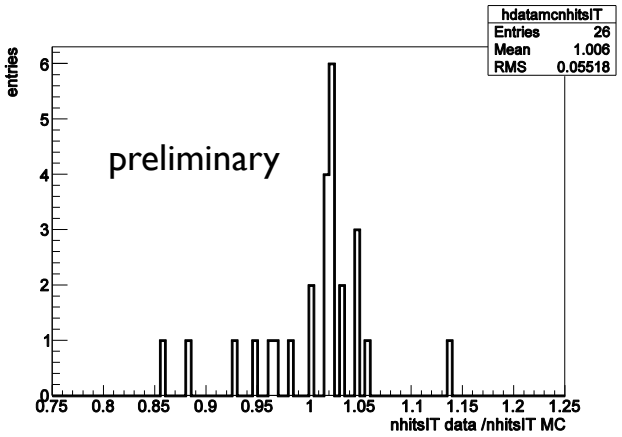
After correction:



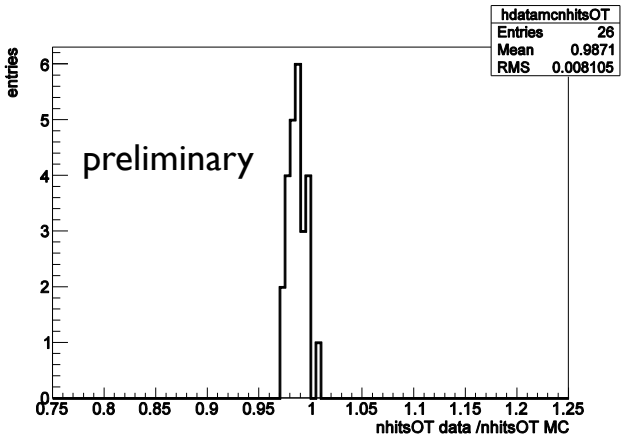
Systematics



TT



IT



OT

- Plots show $\frac{Mean\ \ number\ \ of\ \ hits\ \ data}{Mean\ \ number\ \ of\ \ hits\ \ MC}$ in different phase space bins
- Use RMS as estimate for systematic uncertanties:
  TT ± 1.5 %, IT ± 6%, OT± 1%
- Look at ± Monte Carlo to evaluate systematics